Supplementary materials: Theoretical and methodological support

S1. Literature review

The transition to agroecology in Europe is increasingly recognized as a vital strategy for achieving sustainable agricultural practices that align with environmental, social, and economic goals. In this context, supporting policies reflect a complex interplay of instruments, actor engagement, and contextual challenges. Existing policy frameworks include instruments that are directly or indirectly supportive for principles or practices endorsed by agroecology. However, improved design of public policy and market instruments is needed to remove a series of barriers that lock European agri-food systems into conventional models of production and consumption (Peeters et al., 2021; Place et al., 2022). The expected role of policy is not only to encourage the adoption of sustainable practices in conventional farming systems, but also to sustain the continuous improvement of farming practices, to convey new and recovered traditional knowledge to all the actors involved in agri-food systems and to improve consumer awareness (CFS, 2021; HLPE, 2019; SCAR, 2023; Vicente-Vicente et al., 2023).

In the European Union (EU), the Common Agricultural Policy (CAP) serves as a foundational framework for agricultural policy. However, its effectiveness in promoting agroecological practices has been a subject of debate. Some authors argue that while the CAP includes provisions for organic farming and environmental stewardship, it often prioritizes conventional farming methods, which can hinder the broader adoption of agroecological practices (Place et al., 2022). Others highlight the need for transformative changes within the CAP to create favourable conditions for agroecology transitions, particularly where agricultural practices are heavily subsidized and regulated (Runhaar, 2021).

The development of tailored policy frameworks is essential for addressing the specific socio-economic barriers to agroecological transitions, while considering local agricultural practices and community needs. Policies should be adaptable and responsive to local contexts, particularly in rural areas where farming systems vary significantly (Gava et al., 2025). Recent literature points to public procurement as a significant strategy for promoting agroecological practices across Europe, proposing that coherent policies across territorial and systems levels are necessary to ensure that all citizens benefit from transitions to agroecological farming systems (Prost et al., 2023). The emphasis on public procurement, especially where centralized purchasing power can influence local food systems, reflects a growing recognition of the role that institutional purchasing can play in supporting local agroecological production (Cruz et al., 2023).

Actor engagement is critical in agroecology transition strategies. A collaborative approach is essential for bridging the gap between agroecological ideals and practical implementation, stimulating co-innovation among farmers, researchers, and policymakers to develop new technologies and market environments that support agroecological practices (Dumont et al., 2021). For example, in various European contexts, grassroots movements have been instrumental in advocating for agroecology, highlighting the influence of social movements in shaping policy decisions (Wezel et al., 2018).

Despite the progress made so far, several structural barriers impede agroecological transitions. For example, agricultural policies have often favoured conventional farming practices, creating a challenging environment for agroecology initiatives, particularly in regions with strong industrial agricultural systems (Brumer et al., 2023). Fostering agroecology transitions requires coherent policy frameworks that integrate economic, social, and environmental dimensions, ensuring alignment across multiple governance levels (López-García & González de Molina, 2021).

S2. Methodology

S2.1. Theory

Mixed methods research integrates qualitative and quantitative analyses to provide a more complete understanding of complex phenomena, overcoming the limitations of individual approaches (Creswell & Plano Clark, 2011; Johnson et al., 2007). This approach is particularly relevant when addressing diverse research questions and generating insights from multiple data sources (Bryman, 2006). Recent studies in agricultural economics have extended mixed methods frameworks to include decision-support tools such as multi-criteria analysis (MCA) (Huber et al., 2019).

Mixed methods research uses the integration of qualitative and quantitative analyses to provide a more complete understanding of complex phenomena, than by applying either approach alone (Creswell & Plano Clark, 2011). The logic behind that research approach is attempting to eliminate the known potential weaknesses of individual methods in relation to contextual aspects of the object of research, including their ability to generate all the required information to pursue the purpose of the study, to improve the viability of the study and the practical usefulness of its findings (Johnson et al., 2007). Two overarching rationales lie behind the selection of mixed methods as a research strategy: (i) the need for quantitative and qualitative evidence to answer specific and distinct research questions; (ii) the ability of diversified data collection and analysis to generate a wealth of information that researchers can investigate to discover inconsistencies between qualitative and quantitative results and generate findings that they had not anticipated (Bryman, 2006).

Mixed methods research relies on rigorously defined procedures for qualitative and quantitative data collection and analysis; its distinctive characteristic and value-added lies in the integration of methods and findings (hereinafter just integration) (Creswell & Plano Clark, 2011). The different approaches to integration are identified based on their level of implementation in the research workflow, i.e. research design, methods, and interpretation and reporting (Fetters et al., 2013), as follows: (i) triangulation, i.e. the results from different methods are expected to be mutually supportive; (ii) complementarity, i.e. the results from one method can be used to explain those from the other method, thereby enhancing the internal validity of the process; (iii) development, i.e. the results from one method inform the development of the other method; (iv) initiation, i.e. the results from one method are expected to pinpoint paradox, contradiction, or new perspectives; (v) expansion, i.e. different methods with different research aims can widen the breadth and range of inquiry of the study (Bryman, 2006; Greene et al., 1989).

To date, mixed methods studies in the field of agricultural economics have combined exploratory qualitative analyses largely with explanatory quantitative analyses. However, recent scientific interest has emerged to extend the concept of mixed methods approaches to include a wider variety of quantitative and semi-quantitative approaches, including tools and methods to assist decision-making, such as multi-criteria analysis (Huber et al., 2019).

MCA is a widely used group of analytical tools to solve decision problems in research and policy contexts, by enabling the ranking, selection and/or comparison of different options based on multiple evaluation criteria, considered simultaneously (Belton & Stewart, 2002). MCA is a suitable decision support method in mixed methods approaches to policy evaluation, by considering the voice of relevant stakeholders and thus delivering context-specific recommendations with practical usefulness to allow the sustainability transition of agri-food systems (Knickel & Kasperczyk, 2009; S. Mortimer et al., 2010). Especially, the combination of MCA with qualitative evaluation can provide useful evidence for improving policy instruments, by addressing a variety of aspects, from design to impacts, and interaction (Cuevas, 2016; Myllyviita et al., 2014). There are several examples of combinations, e.g. with the analysis of Strengths, Weaknesses, Opportunities and Threats (for example (Kurttila et al., 2000; Sangkakool et al., 2018; Treves et al., 2020)) or, most commonly, with less formalised methods (e.g. (Harris-Lovett et al., 2019; Strang, 2011b; Zaman et al., 2018)). Especially, a

participatory approach to MCA is often used in mixed methods frameworks, by involving actors in all the steps of method development and implementation (e.g. (Huber et al., 2019; D. Mortimer et al., 2019; Strang, 2011a).

S2.2 Empirical methods

This study integrates the findings from two research steps achieve two complementary purposes: (i) MCA aims at prioritising directions for policy intervention based on actors' goals, i.e. the development and implementation of adoption, positioning, or amplification actions; and (ii) qualitative evaluation aims at integrating policy ranking, by providing insights on policy mechanisms to achieve the desired changes. Integration of findings involves discussing their implications for achieving actors' goals (Fetters et al., 2013).

S2.2.1 Multi-criteria analysis

A participatory MCA is carried out, i.e. one that relies on the preferences of a variety of actors, (experts representing different interests and offering a multiplicity of viewpoints), to evaluate policy instruments and to develop the list of evaluation criteria (Dean, 2020).

The list of evaluation criteria is developed through a consultation with European level experts, aiming at highlighting the perceived or expected performance of individual instruments to achieve case study goal (Dean, 2020). Based on a preliminary list of evaluation criteria, experts are called to express their perspective on criterion suitability for the evaluation of agroecology-supportive policy instruments, considering the diversity of European agri-food systems. Expert perspective is expressed through a set of dedicated criteria

Members of the EU-level multi-actor platform (MAP) and project actor group (PAG) were invited to verify the suitability of a provisional list of criteria for evaluating the performance and relevance of the market and policy instruments, preselected by case study (CS) partners.
A list of 11 assessment criteria were selected by the research team based on a literature review, for evaluating the instruments in the assessment stage (Table S1).

Table S 1. Provisional set of evaluation criteria and practical examples for the evaluation.

Criteria	**Description**
Effectiveness	The extent to which the direct results of interventions (output) contribute to the removal of specific barriers that hinder the achievement of the envisaged changes. A MPI is considered effective if it allows to remove the barriers. Scoring example *Score 5* (Very strong) – when the direct outcomes of the MPI allows to remove the barriers the MPI is supposed to support (e.g. when the barrier 'lack of knowledge'/'financial constraints'/'limited development of local supply chains is supposed to be removed by the instrument ' support for advisory services'/' new mechanisms to support investments'/'new regional regulation for public canteens'). *Score* 0 (Very weak) – when the direct outcomes of the MPI do not allows to remove the barriers the MPI is supposed to support (e.g. when the barrier 'lack of knowledge'/'financial constraints'/'limited development of local supply chains is not significantly influenced by the instrument 'support for advisory services'/' new mechanisms to support investments'/'new regional regulation for public canteens').
Robustness to uncertainties	The extent to which the instrument maintains its performance under a wide range of changes on environmental, climate and socio-economic scenarios. Scoring example *Score 5* (Very strong) – when the effectiveness of the instrument is not influenced by external conditions (e.g. when the outcomes of the action 'planting buffer strips'/'productive investments'/'setting trade agreements' promoted by the instrument is not influenced by external conditions because 'rainfall events are regular'/'markets conditions are stable'/'legal condition are stable'). *Score 0* (Very weak) – when the effectiveness of the instrument is largely dependent on external conditions (e.g. when the outcomes of the action 'planting buffer strips'/'productive investments'/'setting trade agreements' promoted by the instrument is influenced by external conditions because 'rainfall events are not regular'/'markets conditions are not stable'/'legal conditions are not stable').

Criteria	Description
Targeting	The extent to which the instrument targets the actors who cannot fully implement the envisage changes in the agroecological practices due to the barriers. Scoring example *Score 5* (Very strong) – when the instrument 'support for planting buffer strips'/'new mechanisms to support investments'/'provision of new certification schemes' is meant to be implemented by target actors (e.g. 'farmers that face the barriers 'inadequate incentives to promote agroecology'/'financial constraints for small farms'/'unfair market conditions for sustainable products'). *Score 0* (Very weak) – when the instrument 'support for planting buffer strips'/ 'new mechanisms to support investments' / 'provision of new certification schemes' is largely not implemented by target actors (e.g. 'farmers whose agroecological production choices are not affected by any particular barrier).
Verifiability	The extent to which the regulator (i.e. public body/private actor in charge) is able to enforce the MPI prescriptions through monitoring. Scoring example *Score 5* (Very strong) – when the action 'planting buffer strips' / 'productive investments'/'setting trade agreements' addressed by the instrument is easily monitored by the Regulator and any non-compliance is effectively sanctioned. *Score 0* (Very weak) – when the action 'planting buffer strips' / 'productive investments'/'setting trade agreements' addressed by the instrument is not easily monitored by the Regulator and any non-compliance is not effectively sanctioned.
Feasibility	Existence of the conditions (e.g. technical capacity, economic strength, socio-cultural acceptance and potential conflicts with current legal settings) required to implement and enforce the MPI by the Regulator (i.e. public body/private actor in charge). Scoring example *Score 5* (Very strong) – when the instrument 'support for planting buffer strips' /'new mechanisms to support investments'/ 'provision of new certification schemes' is easily implementable (e.g. no particular economic/technical/socio-cultural/legal conditions oppose to the implementation of the instrument). *Score 0* (Very weak) – when the instrument 'support for planting buffer strips' / 'support for productive investments' / 'provision of new certification schemes' is hardly implementable (e.g. because of 'no availability of specialized machineries to plant buffer strips in the region'/'opposition of farmers against increasing the financial resources for investments at the expenses of other typologies of payments'/'lack of legal conditions to guarantee the correct enforcement of the new certification scheme').

Criteria	Description
Flexibility	The extent to which the measures can be adjusted, complemented or reversed when they turn out to be inadequate or inappropriate in practice. Scoring example *Score 5* (Very strong) – when the instrument 'support for planting buffer strips'/'support for productive investments'/'provision of new certification schemes' can be easily adjusted when this turn out to be inadequate (e.g. easy to change 'eligibility criteria'/'investments requirements'/'contractual rules'). *Score 0* (Very weak) – when the instrument 'support for planting buffer strips'/'support for productive investments'/'provision of new certification schemes' cannot be easily adjusted when this turn out to be inadequate (e.g. not easy to change 'eligibility criteria'/'investments requirements'/'contractual rules').
Synergy	The extent to which the performances of the MPI are empowered by the implementation of the other MPIs of the transition strategy under evaluation. Scoring example *Score 5* (Very strong) – when the performances of the instrument 'support for planting buffer strips'/'support for productive investments'/'provision of new certification schemes' are strongly empowered by the others instruments under evaluation (e.g. high synergy with the instruments 'forbidding pesticides and fertilizers uses in proximity of water courses'/'promotion of local food procurements for public canteens'/'simplification of the bureaucracy for small processing activities'). *Score 0* (Very weak) – when the performances of the instrument 'support for planting buffer strips'/'support for productive investments'/'provision of new certification schemes' are not empowered by other instruments in the strategy.
Urgency and priority	The extent to which the MPI is considered important for the strategy. Specifically, Urgency refers to the timeliness (whether the instrument should be implemented first) and Priority to the relative importance of the instrument in supporting the strategy (whether the instrument is essential in supporting the strategy). Scoring example *Score 5* (Very strong) – when the barrier 'inadequate incentives to promote agroecology'/'financial constraints for small farms'/'unfair market conditions for sustainable products' supposed to be removed by the instrument 'support for planting buffer strips'/'support for productive investments'/'provision of new certification schemes' is of primary importance among the barriers supposed to be removed by the set of instruments under evaluation. *Score 0* (Very weak) – when the barrier 'inadequate incentives to promote agroecology'/'financial constraints for small farms'/'unfair market conditions for sustainable products' supposed to be removed by the instrument is considered of minor importance among the barriers supposed to be removed by the set of instruments under evaluation.

Criteria	Description
Policy consistency	The extent to which the objectives pursued by the instrument contrast with the other objectives of the transition strategy. Scoring example *Score 5* (Very strong) – when the implementation of the instrument 'support for productive investments' addressed to 'improve competitiveness' do not neutralise none of the other objectives of transition strategy. *Score 0* (Very weak) – when the implementation of the instrument 'support for productive investments' addressed to 'improve competitiveness' neutralizes the other objective 'pollutants abatement in water bodies' pursued by the other instruments under evaluation.

Members of the EU-level MAP and PAG shortlisted the criteria by evaluating them against 4 performance dimensions on a 0-5 Likert scale (very weak to very strong), as follows:

- Clarity: Are the descriptions offered to explain the provisional set of criteria clear enough? If not, please specify which one is unclear and try to provide an alternative explanation.
- Completeness: Does the list include all important criteria to assess the performance and relevance of market and policy instruments? If not, please add to the list of criteria.
- Redundancy: Are there any unnecessary criteria? If yes, please indicate the unnecessary criteria.
- Operationality: Is there any criterion that is not suitable to assess market and policy instruments?

The output of the pre-assessment is a shortlist of the criteria for use during the assessment stage. The aim of this selection is to avoid and overflow of information that can increase the analytical effort by the stakeholders which can result in reduced accuracy of the assessment and difficult communication of the outputs to the target audience.

The result of the consultation is the following consolidated list of evaluation criteria for the MCA exercise:

1) Effectiveness: the instrument enables change towards agroecology / sustainability within the agri-food system;
2) Undesired effects: the instrument has unintended consequences that can exacerbate current sustainability issues;
3) Targeting: the instrument focuses on the actors in the agri-food system who are responsible for implementing change;
4) Efficiency: the instrument can drive more beneficial change or at lower costs compared to alternative instruments;
5) Feasibility: the instrument supports change that can be implemented in the agri-food system.

The MCA exercise involves two tasks for the engaged actors, i.e. scoring and weighting. Scoring implies eliciting scores for each policy instrument against each evaluation criterion. Scores are expressed on a Likert-type scale, ranging from 0 (the instrument performs very badly) to 5 (the instrument performs very well). Weights are assigned to describe the degree of suitability of each criterion for the evaluation of individual policy instruments. Weights are provided on a continuous scale in the range 0 (the criterion is not suitable) to 1 (this is the only suitable criterion). Per each policy instrument, criteria weights sum to 1.

Scores and weights are used to calculate a single MCA score per each instrument, as follows:

$$Single\ MCA\ score = \sum_{i=1}^{n} w_i\, S_{i,j} \qquad (1)$$

where,

i = criteria

j = policy instruments

w = criterion weights

S = sum of expert scores

A utility-based approach (full aggregation) is adopted through multi-attribute utility theory, given the limited number of well-defined options under study (Cinelli et al., 2014). A simple weighted average is used instead of more complex models, due to the advantages it offers for transparency to the user and parsimony of data collection, which are important aspects in participatory research (de Vente et al., 2016; Stewart, 1995). The most preferred policy instrument is the one with the highest single MCA score (Munda, 2005).

S2.2.2 Qualitative evaluation

This exercise relies on the same set of respondents of the MCA in each case study (Creswell & Plano Clark, 2011). The objective of the qualitative evaluation is to support the MCA findings by understanding the mechanisms through which actors expect the evaluated policy to help achieve the goals of the case study. This exercise aims to unravel policy mechanisms. This exercise is conducted through a relatively unstructured group discussion, where a non-binding discussion draft is provided to encourage a wide variety of perspectives on the policy instruments under evaluation. The draft focuses on three core themes: (i) strengths and weaknesses of the evaluated policy instruments; (ii) necessary policy design and governance changes; and (iii) synergies with related policy frameworks. Flexibility is allowed for research teams in the case studies regarding workshop facilitation.

S3. Data and case studies

This research is part of a broader participatory process targeting policy-related issues, which ended in Summer 2021 (Gava et al., 2022). The identification of potential policy instruments for evaluation resulted from a dedicated research activity (Linares Quero et al., 2022). A preliminary list of policy instruments was refined by locally-based members of the research team to limit the total number of instruments under evaluation in each case study to 10-15 (see (Galioto et al., 2021) for more details on individual policy instruments). The final list of policy instruments covers several policy areas that share the overarching aim of policy intervention and is provided in the main manuscript text.

Policy areas are used as a guiding thread for integrating the results across the case studies (Gava et al., 2022).

The case studies are selected at the research project level to represent a diverse range of geographical areas, territorial scope, and farming systems across Europe, as well as different levels of agroecology adoption, i.e. those that are beginning to adopt agroecological practices (initiating) and those that are advancing (enhancing) the outcomes of practices already in place. (Table).

Table S 2. Case study features, goal and number of engaged actors in the evaluation (adapted from (Gava et al., 2025)). Source: Authors' own elaboration.

Driving action goal	Case study	Territorial scope	Farming system	Agroecological practice uptake	Specific action	Engaged actors
Adoption	Lake Lucerne, Switzerland	Local	Livestock	Initiating	Increasing agricultural diversification	4
	Nienburg, Germany	Local	Arable	Initiating	Diffusion of conservation agriculture practices	8
	Nivala, Finland	Local	Livestock	Initiating	Installation of a collective biogas plant	7
	Imathia, Greece	Subnational	Permanent crops	Initiating	Diffusion of integrated pest management practices	7
	Hungary	National	Arable	Initiating	Adoption: diffusion of conservation agriculture practices	10
Positioning	Lithuania	National	Livestock	Enhancing	Creating a producer cooperative	10
	Latvia	National	Livestock	Enhancing	Sustainability labelling and creating a marketing cooperative	11
	Transylvania, Romania	Subnational	Mixed	Enhancing	Promotion and awareness campaigns about traditional food and farming	7
	Sweden	National	Livestock	Initiating	Marketing for plant-based food for direct human consumption	6
	Scotland, United Kingdom	Subnational	Mixed	Initiating	Promotion and awareness campaigns about sustainable food produced locally	12
Amplification	Kaindorf, Austria	Local	Arable and livestock	Initiating	Developing a territory of sustainable arable farming	5
	Vysočina, Czech Republic	Subnational	Livestock	Enhancing	Scaling out organic dairy farming	10
	Basque Autonomous Community and Navarra, Spain	Subnational	Mixed	Enhancing	Scaling out agroecological arable farming	8
	Auvergne and Rhône-Alpes, France	Subnational	Permanent crops	Initiating	Developing a territory of sustainable viticulture	10

Driving action goal	Case study	Territorial scope	Farming system	Agroecological practice uptake	Specific action	Engaged actors
	Chianti, Italy	Local	Permanent crops	Enhancing	Developing an agroecology territory	12

Each case study is structured towards a specific action that actors aim to develop and implement. Three action types are identified that define the driving goals of the case studies (Gava et al., 2025):

- Adoption actions aim to foster the introduction of agroecological practices in predominantly conventional farming systems. These early-stage actions in agroecology transition pathways focus on increasing efficiency or substituting inputs (incremental change) in conventional farms, where agency remains individual.
- Positioning actions aim at creating and stabilising a demand for agroecological products that are already available from the farms in the agri-food system. Positioning actions still promote incremental change and are characterised by individual agency Compared to adoption actions, they are at a relatively more advanced stage in transition pathways.
- Amplification actions aim to increase the size and impact of agroecological farming by fostering transformative changes through collective agency. These actions generally build on previous collaboration projects and are characterised by their collective nature, with the overarching goal of expanding the size and effects of agroecology.

Case study goals guide the interpretation of MCA findings and structure the integration of results in the discussion section. Findings from the qualitative evaluation are presented by policy area, as the emerging policy mechanisms did not vary based on case study goals.

All actors engaged into participatory activities are identified from the project's Multi-Actor Platforms, i.e. forums for exchanging ideas for co-learning and knowledge co-creation that bring together researchers, policymakers and civil society (Zawalińska et al., 2022). Actors are drawn from those of most relevance at the case study level, to include a multiplicity of viewpoints, fields of expertise about agricultural and food policy and market mechanisms, such as formal and vocational education, certification bodies, research, advisory services, environmental associations, consumers and consumer associations, farmers and farmer unions, food value chain, governmental and administrative organisations.

Research team members in the case study countries facilitated participatory data collection, also by preparing materials and carrying out the exercises in local languages and translating fieldwork reports into English.

S4 Additional results

S4.1 Policy ranking

In addition to Table A1 in the main manuscript text, Table S3 shows weights and scores from the MCA .

Table S 3. Criterion weights by policy area and policy scores by criterion weight.

Transition goal	Policy area	Average weights					Average scores				
		Feasibility	Efficiency	Targeting	Undesired effects	Effectiveness	Feasibility	Efficiency	Targeting	Undesired effects	Effectiveness
Adoption	Agri-environment payments	0.25	0.18	0.19	0.14	0.24	3.1	3.0	3	2.7	3.1

	Certification schemes	0.22	0.17	0.19	0.14	0.27	2.9	3.5	3.6	2.3	3.6
	Cross-cutting and context-specific	0.24	0.15	0.22	0.13	0.27	3.4	3.6	3.7	2.3	3.7
	Food policies	0.26	0.16	0.20	0.15	0.23	2.6	2.4	2.5	3.4	2.2
	Income and market support	0.29	0.21	0.16	0.16	0.19	3.6	2.5	2.6	2.6	2.3
	Knowledge promotion	0.22	0.18	0.19	0.14	0.27	3.5	3.8	3.6	2.3	4.0
	Networking and cooperation	0.24	0.17	0.19	0.15	0.24	3.0	3.2	3.3	3.1	3.4
	Payments for investments	0.22	0.17	0.20	0.13	0.27	3.9	3.6	3.8	2.3	3.8
Positioning	Agri-environment payments	0.19	0.21	0.20	0.14	0.26	3.3	3.0	3.4	3.3	3.4
	Certification schemes	0.2	0.23	0.30	0.10	0.18	2.6	2.8	3.2	2.7	2.8
	Cross-cutting and context-specific	0.19	0.17	0.18	0.17	0.29	2.5	2.4	2.4	2.0	2.5
	Food policies	0.22	0.22	0.19	0.13	0.24	3.2	3.3	3.5	3.1	3.3
	Income and market support	0.20	0.23	0.19	0.14	0.25	3.2	3.1	3.4	2.9	3.3
	Knowledge promotion	0.23	0.22	0.20	0.13	0.23	3.7	3.3	3.6	3.0	3.8
	Networking and cooperation	0.20	0.20	0.21	0.14	0.25	3.1	3.3	3.4	3.5	3.6
	Payments for investments	0.21	0.24	0.21	0.12	0.22	3.5	3.4	3.5	2.8	3.6
Amplification	Agri-environment payments	0.21	0.20	0.19	0.13	0.26	3.4	3.2	3.6	2.9	3.4
	Certification schemes	0.21	0.20	0.19	0.15	0.25	2.72	3.3	3.7	2.6	3.8
	Cross-cutting and context-specific	0.25	0.21	0.16	0.11	0.26	3	3.9	4.2	3.8	3.9
	Food policies	0.20	0.20	0.21	0.10	0.30	1.5	1.6	1.6	1.6	1.5
	Income and market support	0.21	0.19	0.21	0.13	0.26	3.4	3.4	3.5	2.9	3.7
	Knowledge promotion	0.21	0.20	0.20	0.12	0.26	3.6	3.5	3.7	3.3	4.1
	Networking and cooperation	0.24	0.21	0.18	0.12	0.26	3.5	3.7	3.9	3.6	3.9
	Payments for investments	0.22	0.20	0.19	0.13	0.26	3.4	3.1	3.7	2.9	3.4

Effectiveness consistently emerges as the most influential criterion across all action types, underscoring its central role in policy evaluation. Feasibility and efficiency are particularly critical in adoption actions, reflecting the importance of practical implementation and cost-effectiveness

when introducing agroecological practices. In contrast, targeting and undesired effects gain prominence in positioning and amplification actions, where actors are more concerned with aligning instruments to specific market mechanisms and mitigating unintended consequences.

For income and market support, feasibility is highly weighted in adoption actions, suggesting its perceived utility in enabling entry-level sustainability practices. However, its lower weighting in positioning and amplification indicates limited relevance for scaling agroecology territorially. Efficiency is moderately weighted across all action types, but particularly for food policies in adoption and positioning, suggesting potential cost-effectiveness concerns in these areas. This implies that while income support may facilitate initial transitions, its role in broader systemic change is less pronounced.

Targeting is especially emphasized for certification schemes in positioning actions, highlighting the importance of market-based instruments in creating demand for agroecologically produced food. Meanwhile, undesired effects generally receive the lowest weights across most policy areas and action types, indicating limited concern about negative externalities. An exception is the cross-cutting and context-specific policy area (e.g., fiscal instruments), where undesired effects are more heavily weighted in positioning actions—likely due to economic uncertainties associated with market creation.

Networking and cooperation and cross-cutting instruments score highly in targeting and effectiveness within amplification actions, reflecting their strategic role in expanding agroecology through collective agency. Finally, knowledge promotion consistently achieves the highest scores for effectiveness across all action types, reinforcing its pivotal role in enabling agroecological transitions through capacity building and information dissemination

Top-ranked policy areas

None of the policy areas stands out as performing very well, suggesting there is no simple fix and reflecting the complexity of agroecology transitions, which require a systemic approach that integrates multiple policy areas.

Across all action types, knowledge promotion emerges as the most consistently high-performing policy area. It receives high scores and weights for effectiveness (e.g., adoption: 4.0, weight: 0.28; amplification: 4.1, weight: 0.27), confirming its central role in enabling agroecological transitions through capacity building and knowledge dissemination.

Payments for investments are also highly ranked, particularly in adoption (3.6) and positioning (3.4). Their strength lies in feasibility and effectiveness for adoption (scores: 3.9 and 3.8), and in targeting and efficiency for positioning (scores: 3.5 and 3.6), suggesting their relevance for farm-level upgrades and market alignment.

In amplification actions, networking and cooperation and cross-cutting/context-specific instruments (both 3.7) are top-ranked. These instruments score particularly high in targeting and effectiveness (e.g., targeting: 4.2 for cross-cutting), reflecting their strategic role in fostering collective agency and systemic change.

Moderate-ranked policy areas

Several instruments occupy a middle ground, showing balanced performance across criteria. Networking and cooperation ranks moderately in adoption and positioning (3.3), with effectiveness and feasibility as key strengths. Certification schemes and cross-cutting instruments also perform moderately in adoption, with strong targeting and efficiency scores, though their relevance appears more context-dependent.

In positioning, agri-environment payments, food policies, and income and market support all rank moderately (3.2–3.3), with effectiveness as the most influential criterion. In amplification, knowledge promotion remains strong (3.6), while income support, investment payments, and agri-environment payments show balanced but less pronounced performance (3.3–3.4), suggesting they are supportive but not transformative on their own.

Lower-ranked policy areas

Lower-ranked instruments reveal important limitations. In adoption, income and market support (2.9) and agri-environment payments (3.0) show low effectiveness and efficiency scores, indicating limited perceived impact in early-stage transitions.

Certification schemes rank lower in positioning (3.0) and amplification (3.2), primarily due to concerns about undesired effects (scores: 2.6–2.7) and low weights for this criterion, suggesting limited trust in their broader systemic value.

Food policies are the lowest-ranked overall, especially in amplification (1.6), where they receive low scores across all criteria despite high weighting for effectiveness. This mismatch suggests a perceived need for redesign or better integration with agroecological goals.

Finally, cross-cutting instruments rank lower in positioning (2.4), with undesired effects scoring particularly low (2.0) but receiving relatively high weight (0.17), indicating concerns about unintended economic or regulatory consequences.

S4.2 Policy mechanisms

Income and market support

Income and market support policies play a role in maintaining farm viability, regulating agricultural markets, and supporting producer organisations. Instruments such as direct area-based payments, greening payments, cross-compliance, and payments for areas with specific constraints are designed to enhance financial stability for farmers. This stability is seen as a prerequisite for innovation and entrepreneurship, particularly in contexts where economic uncertainty may hinder the adoption of sustainable practices.

By reducing financial risk, these instruments can facilitate investment in agroecological methods and technologies, thereby supporting transitions along the agroecology pathway (Place et al., 2022). However, their effectiveness varies depending on the stage of transition and the type of action pursued.

In adoption-oriented contexts, such as the case study in Nienburg, Germany, income support mechanisms like greening payments and cross-compliance were perceived as enabling the diffusion of conservation agriculture practices. These instruments provided the financial buffer needed for conventional farmers to experiment with agroecological techniques.

In amplification-oriented settings, such as Kaindorf, Austria, direct area-based payments were highlighted for their role in sustaining ongoing investments in sustainable arable farming. Respondents noted that these payments not only supported existing practices but also encouraged new entrants to follow agroecological models, thereby fostering collective momentum for territorial expansion.

Income and market support instruments are not explicitly designed for agroecology. However, their stabilising effect can indirectly support transitions, particularly when aligned with environmental objectives and complemented by other enabling policies.

Agri-environment payments

Agri-environment payments are among the most established instruments for promoting sustainable farming practices in Europe. These mechanisms offer financial compensation to farmers for adopting or maintaining environmentally beneficial practices, often offsetting income losses incurred during the transition to agroecology. Their familiarity and accessibility make them particularly attractive to farmers, especially in early-stage transitions.

These payments are designed to reduce the economic risks associated with changing long-standing practices, thereby making agroecological approaches more viable (Duru et al., 2015). However, their effectiveness is highly context-dependent including how well they are tailored to specific farming systems and transition goals (Gava et al., 2022; Paulus et al., 2022).

In adoption-focused contexts, such as Nivala, Finland, agri-environment payments supported the installation of a collective biogas plant by incentivising sustainable feedstock cropping. This financial support helped farmers overcome initial barriers to adopting new energy-related practices.

In amplification-oriented settings, such as Vysočina, Czech Republic, these payments facilitated the scaling out of organic dairy farming. By compensating farmers for income losses during the transition, the instruments enabled broader participation and collective uptake of agroecological methods across the region.

While agri-environment payments are effective in encouraging incremental change, their impact on systemic transformation may be limited unless integrated with broader governance frameworks and complementary instruments. Their role in agroecology transitions is strongest when they are context-sensitive and aligned with long-term sustainability goals.

Payments for investments

Payments for investments are key instruments for supporting farm-level innovation and infrastructure upgrades, particularly in response to the growing demand for agroecologically produced food. These instruments provide financial support for capital investments, enabling farmers to enhance physical assets, diversify activities, and adopt new technologies aligned with sustainability goals.

Their relevance is especially pronounced for small and medium-sized farms, which often lack the financial capacity to undertake significant upgrades independently. By reducing upfront costs and investment risks, these instruments can accelerate the adoption of agroecological practices and improve farm resilience (Place et al., 2022; Prost et al., 2023). In adoption-focused contexts, such as Imathia, Greece, payments for investments facilitated the uptake of integrated pest management practices. Financial support enabled farmers to acquire the necessary equipment and technologies, making the transition from conventional pest control economically feasible.

In amplification-oriented settings, such as Chianti, Italy, payments for investments supported the development of sustainable viticulture infrastructure. These instruments were seen as essential for scaling agroecological practices across the territory, fostering synergies between environmental stewardship and economic viability.

Overall, payments for investments are perceived as highly effective when they are tailored to local needs and integrated with broader agroecological strategies. Their capacity to support both incremental and transformative change makes them a valuable component of agroecology-enabling policy frameworks (Buratti-Donham et al., 2023; Helenius et al., 2020).

Knowledge promotion

Knowledge promotion policies are widely recognised as pivotal enablers of agroecological transitions. These instruments, ranging from advisory services and training programmes to peer-to-peer learning and formal education, support the development of technical skills, entrepreneurial capacity, and systems thinking among farmers and other agri-food system actors.

By bridging the gap between research and practice, knowledge promotion fosters informed decision-making and empowers farmers to adopt sustainable practices tailored to their local contexts (Gliessman, 2020; Teixeira et al., 2018). These instruments are particularly effective when they are participatory, context-sensitive, and integrated with other policy areas.

In adoption-focused settings, such as Hungary, knowledge promotion facilitated the diffusion of conservation agriculture practices. Advisory services and training programmes provided farmers with practical tools and financial guidance, enabling them to implement agroecological methods within conventional systems.

In amplification-oriented contexts, such as the Basque Autonomous Community and Navarra, Spain, knowledge promotion was essential for scaling agroecology. Respondents emphasised the importance of collective learning and capacity building to support territorial expansion and long-term sustainability.

Beyond technical training, knowledge promotion also plays a strategic role in enhancing market access, fostering innovation, and strengthening actor networks. Co-created knowledge—blending scientific insights with local expertise—was seen as particularly valuable in supporting holistic approaches to farming and food systems (Sanders et al., 2021). The effectiveness of knowledge promotion depends on its ability to respond to diverse needs across transition stages. Tailored advisory services, inclusive education frameworks, and coordinated knowledge-sharing platforms are essential to unlock the transformative potential of agroecology across Europe (Wezel et al., 2018).

Certification schemes

Certification schemes are market-based instruments designed to reduce information asymmetry between producers and consumers by providing credible labels that reflect the sustainability of farming practices. These schemes can enhance consumer trust, support premium pricing, and increase the value-added of agroecologically produced food.

By signalling environmental and social performance, certification can help farmers differentiate their products in competitive markets. However, their effectiveness in supporting agroecology transitions depends on the credibility of the certification process, the level of consumer awareness, and the capacity of farmers to meet certification standards.

In positioning-focused contexts, such as Lithuania and Latvia, certification schemes played a key role in supporting the creation of producer cooperatives and sustainability labelling for dairy products. These instruments helped build market demand by enabling cooperatives to communicate the environmental credentials of their products, thereby attracting consumers willing to pay a premium.

Despite their potential, concerns emerged in several case studies about the unintended consequences of certification schemes, particularly in amplification contexts. Respondents noted that certification processes can be costly, bureaucratic, and misaligned with local agroecological values, potentially excluding small-scale producers or reinforcing conventional standards, and reflecting concerns about co-opting the agroecology concept and diluting its transformational potential (Walthall et al., 2024).

Certification schemes are most effective when embedded within broader strategies that include consumer education, support for compliance, and alignment with agroecological principles. Their role in agroecology transitions is not only economic but also symbolic, helping to shape narratives around sustainability and food system transformation.

Food policies

Food policies encompass instruments that regulate the sustainability of food systems beyond the farm gate, focusing on processing, distribution, and consumption. These policies can play a strategic role in creating demand for agroecologically produced food, reducing market uncertainty for farmers, and fostering more sustainable dietary patterns.

By establishing standards and incentives for sustainable food production and consumption—such as public procurement, short supply chains, and school meal programmes—food policies can help align consumer behaviour with agroecological goals. However, their effectiveness depends on coherence across territorial levels and the capacity of local actors to meet regulatory requirements.

In positioning-focused contexts, such as Transylvania, Romania, food policies supported awareness campaigns and localised marketing initiatives that promoted traditional and sustainable food. Similarly, in Scotland, United Kingdom, policies facilitated the development of retail-based initiatives aimed at increasing consumer awareness and demand for locally produced agroecological food.

Despite their potential, food policies were among the lowest-ranked instruments in the MCA, particularly in amplification contexts. Respondents cited low effectiveness scores and concerns about undesired effects, such as administrative complexity and limited adaptability to local needs. This suggests that while food policies can support incremental change, their transformative potential remains underutilised.

To enhance their impact, food policies should be better integrated with supply-side measures, include more ambitious sustainability criteria in public procurement, and be supported by knowledge hubs and actor collaboration platforms. When designed to foster stable demand and reduce barriers to market access, these instruments can become powerful levers for agroecological transitions.

Networking and cooperation

Networking and cooperation policies are instrumental in fostering collective action and building the social infrastructure necessary for agroecological transitions. These instruments, such as operational groups, cooperatives, and innovation hubs, support collaboration across disciplines and sectors, enabling actors to co-develop strategies, share knowledge, and coordinate efforts.

By strengthening trust, social capital, and peer-to-peer learning, networking instruments help overcome fragmentation in agri-food systems and facilitate the emergence of shared agroecological visions. Their relevance is particularly pronounced in contexts where systemic change requires coordinated action beyond individual farms.

In positioning-focused settings, such as Sweden, networking policies supported the creation of platforms for actors involved in the production, marketing, and consumption of plant-based foods. These collaborations helped align sustainable production with consumer demand, promoting agroecological dietary choices.

In amplification-oriented contexts, such as Auvergne and Rhône-Alpes, France, networking instruments enabled the development of a territory of sustainable viticulture. Locally developed initiatives, such as roundtables and multi-actor forums, facilitated cooperation among farmers,

advisors, value chain actors, and local administrations, fostering collective agency to achieve agricultural sustainability objectives.

Despite their strong performance in MCA rankings, the success of networking and cooperation policies depends on long-term commitment, inclusive governance, and adequate facilitation. When well-designed, these instruments can catalyse transformative change by embedding agroecology within broader territorial and institutional frameworks.

Context-specific and cross-cutting instruments

Context-specific and cross-cutting instruments encompass a diverse set of policies that address local challenges and broader sustainability goals, including biodiversity conservation, energy policy, fiscal incentives, and land-use planning. Their heterogeneity reflects the need for flexible, place-based solutions that complement agroecological transitions.

These instruments are particularly valuable in tailoring interventions to specific socio-economic and biophysical contexts. When well-integrated with other policy areas, they can help align environmental objectives with economic development, promote fair taxation systems, and support innovation in rural regions.

In adoption-focused settings, such as Lake Lucerne, Switzerland, a nitrogen tax was used to reduce livestock density and promote low-input arable cropping. This targeted fiscal instrument supported agricultural diversification and contributed to the local agroecological transition.

In positioning-oriented contexts, such as Lithuania, tax incentives, including reduced VAT rates and exemptions for cooperatives, were seen as enabling tools for lowering operational costs and supporting the creation of producer organisations. These measures helped align economic incentives with sustainability goals, facilitating market development for agroecological products.

Despite their potential, these instruments received mixed evaluations in the MCA, particularly in positioning actions, where concerns about unintended economic consequences were more pronounced. Respondents highlighted the need for clearer monitoring frameworks and better coordination with other policy domains to avoid fragmentation and ensure policy coherence.

Overall, context-specific and cross-cutting instruments can play a strategic role in agroecology transitions when they are designed to address local needs, integrated with broader governance frameworks, and supported by robust evaluation mechanisms.

S5 Critical assessment of the research design and future directions

The methodological approach, combining MCA and qualitative evaluation, relies on actor perspectives that, while rich and context-sensitive, may be constrained by partial knowledge or sector-specific viewpoints. Although efforts were made to engage a diverse range of actor expertise Multi-Actor Platforms, the findings reflect perceived rather than measured impacts of policy instruments. This may limit the ability to derive implications beyond the case study level. Future explanatory research could complement this approach by drawing causal inference, e.g. with longitudinal studies to assess the actual outcomes of policy interventions over time.

The MCA exercise can effectively capture actor preferences; however, this study uses a simplified scoring and weighting system. This approach enhances transparency and usability but may overlook complex interdependencies between policy instruments and agroecological outcomes. More advanced modelling techniques, such as fuzzy logic or dynamic systems analysis, could be explored to capture these nuances in future evaluations.

Following a participatory research method, the interpretation of findings about policy mechanisms may introduce subjectivity. To address this, future studies could include standardised indicators or performance metrics to triangulate actor perceptions with empirical data.

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